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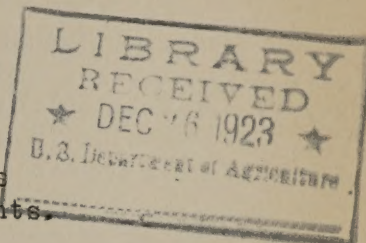
COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. Department of Agriculture
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POTATO SPRAY RINGS

Excerpts from 1922 Annual Reports
of State and County Extension Agents.



This circular is one of a series issued by the Office of Cooperative Extension Work as a part of its informational service to State and county extension workers. The material contained herein is not released for printed publication.

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Washington, D. C.

FOURTH YEAR

Exercises from 1925 Annual Report
of State and County Extension Agents

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Cooperative Education and Home Economics as a part of its efforts to
bring to the attention of the public the various activities of the
extension service. The material
contained herein is not released for printed publication.

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POTATO SPRAY RINGS*

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Importance of the Potato Spray Ring.

Something like 43,000,000 bushels of potatoes were lost to farmers of the United States in 1920 as a result of failure to control late blight.** This estimate does not include the extensive waste which occurred in storage and transit as a result of the harvesting of infected stock. Practically every year, reports of reduced yields following attack by this disease come from one or another of our potato-growing sections, and this in spite of the fact that for more than 20 years farmers have been informed by bulletins, press notices, and from the lecture platform that the vines can be protected by the application of Bordeaux mixture. This spray properly applied not only reduces damage caused by late blight, it also repels the leaf hopper and flea beetle. It is well known that effective insecticides may either be added to Bordeaux or applied alone. Yet, year after year, many farmers make no attempt to spray; others spray but use ineffectual apparatus; while still others may use good machinery but put on the wrong mixture, or perhaps the right one at the wrong time.

The potato spray ring is, in many localities, a means of circumventing the obstacles which may prevent successful disease control, particularly if arrangements are made to employ an experienced spray man to make the applications for all members. Such an organization makes possible an economical use of the best high-powered equipment on field of relatively small acreage. The fact that one man has been given the responsibility

*No attempt is made to cite all references to potato spray rings in this circular. Only selected extracts showing typical methods employed and results secured in a number of States are included. Owing to differences in terminology used in the various States and to other local conditions the information herein should be reviewed by the subject-matter specialist concerned before incorporating any part of it in the extension program for the State.

**Plant Disease Bulletin, Supplement 13, issued by the Plant Disease Survey.

for spraying the total acreage belonging to members of the association gives some assurance that this equipment will be kept in good working order. Moreover, with one operator in charge, it is easier for the extension service to influence the work in such matters as the choice of proper equipment, preparation of effective sprays, and their correct application at the opportune time. Of course this latter aim can easily be defeated unless care is taken to avoid devoting one machine and operator to an acreage too great or to fields which are too scattered.

These things are all brought out rather clearly in the following excerpts, which were taken from the 1922 annual reports of State and county extension agents.

Excerpts from 1922 Annual Reports.

Minnesota

The first potato spray ring in Minnesota was organized at Elk River, Sherburne County, in the spring of 1922. Early in the spring a group of farmers attended a potato meeting where R. C. Rose, extension pathologist from the State experiment station, and the county agent urged the farmers to use Bordeaux mixture applied with a high pressure sprayer, in order to cover the plants effectively from the ravages of the leaf hopper and the flea beetle, which caused a heavy loss in the preceding year.

As a result of this meeting, six farmers agreed to spray their potatoes cooperatively, using a high pressure sprayer. The following agreement was drawn:

We, the undersigned, hereby make application for membership in the Elk River Potato-spraying Association, and agree to conform to the rules and regulations herein contained.

The object of this potato-spraying association is to control the insect pests and fungus diseases which limit the yield of potatoes and cause serious losses to the industry.

Plan of organization: When 50 acres, more or less, have been subscribed to the association, a meeting of the subscribers will be called to elect officers to manage the association. The officers will purchase a suitable sprayer and spray material, hire a man to do the work, and transact such other business as will be necessary for the successful operation of the association.

Each member of the spray ring association agrees to pay his proportionate share per acre of the cost incurred during the season. It is estimated that the cost per acre will be about \$10. Each subscriber agrees to pay the selected treasurer 50 per cent of the cost per acre in advance for each acre subscribed to the association and 50 per cent October 1, 1922.

It is further agreed that the subscriber will furnish horsepower for the man in charge of the spraying and board the man while on his farm, and also leave four check rows in each piece for the purpose of showing

the increased yield due to spraying. Further, each farmer agrees to promptly deliver the sprayer and equipment to the next farm where the sprayer is to be used.

The Sherburne County Farm Bureau will cooperate with the association by assisting in getting a man to do the spraying. The county agent will act as technical advisor to the association; will keep in close touch with the association, particularly in seeing that the man in charge of spraying properly does his work; will detect diseases and insect pests; and will assist in any other way possible.

The subscriber agrees to be governed by a majority of the members of the association and agrees to such regulations for the successful operation of the association as the officers may see fit to establish.

An executive committee was appointed and authorized to purchase a sprayer and all necessary spray material and equipment, and to manage the affairs of the association. A sprayer having a triplex pump was purchased from a Minneapolis distributor. The Bordeaux mixture was homemade. The copper sulphate and the calcium arsenate, which was used as a poison, was purchased through the Hennepin County Farm Bureau. As the sprayer, when purchased, was equipped with only a two-nozzle-to-the-row boom, the first application and part of the second were applied with this nozzle. The three-nozzle boom arrived in time for the last of the second spray. A man was hired at \$3 per day to operate the sprayer. In each field sprayed by the association, a check plot was maintained which was not sprayed with Bordeaux mixture. The potato bugs in this plot were kept in check by the use of Paris green. When the potatoes were mature enough to harvest for the early market, about July 23, the check plots were dug and compared with the sprayed plots. The results showed an average increase of 36 1/4 bushels per acre. Of the total yields, the fields sprayed showed 3 per cent more marketable potatoes than the unsprayed fields. - C. C. Hickman, County Agent, Elk River, Sherburne County.

Ohio

Three spray rings were organized under the supervision of the specialist in vegetable gardening. Increased yields because of the spraying methods demonstrated range from 13.9 to 37.3 bushels per acre. The idea of spray ring organization seems to be making considerable progress in the State. The chief advantage is that it enables even small growers to have the use of a high-powered sprayer, without which thorough spraying is almost, if not quite, impossible. - H. C. Ramsower, Director of Extension Service, College of Agriculture, Ohio State University, Columbus.

The most outstanding potato work has been the organization of the first spray ring. We had been talking of spray rings for some time and this year succeeded in interesting five men who purchased a power outfit. The result in the main has been very satisfactory, showing without doubt that it pays well to spray. An unsatisfactory feature of the organization was that no one man was responsible for the manipulation of the outfit. Each man used the sprayer and returned it to a central place. There seemed to be no way out of such an arrangement this season. On account of this arrangement it was not easy to get accurate records of costs and results, but we succeeded in getting a partial to a full report from every man but one. † E. C. Sleeth, County Agent, Jefferson, Ashtabula County.

In order to give better care to the potato crop after planting it, we organized 11 spray rings. These rings have 111 members and cover 535 acres. Reports from those who kept check rows indicate that the increase in production due to spraying is more than 30 bushels to the acre. The crops committee worked out the rules under which the spray rings were to operate and made arrangements for the handling of material used in spraying. - R. J. Bugbee, County Agent, Burton, Geauga County.

Pennsylvania

Potato spraying continues to occupy the first place in interest and importance. The data compiled show that 16,680 acres were under demonstration in 61 counties of the State, and that the average increase per acre was 66 bushels, or 44 per cent, totaling more than 1,000,000 bushels. To accomplish this result the potato growers have invested almost a quarter of a million dollars in potato sprayers along. The average cost of spraying is about \$10 per acre. The spray ring or cooperative spraying is the most economical way to spray potatoes. Though the results in average increase per acre are never quite so large as when the individual owns and properly operates his machine, the difficulty is overcome in getting the work properly and timely done during the most busy season and providing efficient machines for the small grower. One hundred and eighty-four rings were operated with a membership of nearly 1,000. Combination potato and orchard spraying is making rapid and satisfactory development. The machines are equipped with engines of 3 or more horsepower, pumps capable of pumping 8 gallons per minute under 300 pounds pressure, spray boom for potatoes, and hose and spray gun for orchard use. Farm orchards that once were unprofitable because of lack of time to spray them are now sprayed for the season in four half days and are averaging a net profit of over \$10 per tree. Two hundred and six combination sprayers were operated, serving over 600 farm orchards and a few more small potato growers. * E. L. Nixon, Extension Pathologist, School of Agriculture, Pennsylvania State College, State College.

The farmers in four communities were organized into potato-spraying associations. The general plan of the organization is as follows: A canvass of the territory was made and enough acreage secured in each of the communities to occupy the full time of an operator and spraying machine for the season. The owners of this acreage were then organized into an association and the machine and materials ordered. The county agent obtained the services of the students to operate the machine during the spraying season and kept close supervision over the work to see that everything was done according to the best recommendations. The result was very satisfactory. In the 4 associations, 8 fields show increases of 100 or more bushels per acre, the highest increase being 172 bushels. Two systems of hiring operators were used. Two of the operators were hired on straight salaries; the other two were given a base wage and a bonus of \$1 for each average increase over the entire acreage of the association. In communities where the value of spraying is still doubted by the farmers, it was thought that the bonus system offered a good arrangement, even though it cost more than the straight salary. However, the bonus the operator received will be returned to the members of the association more than 50 times over.- L. E. White, County Agent, Scranton, Lackawanna County.

In the Mountville locality, the spraying association which operated for 2 years was reorganized with a membership of 18. A new spraying outfit was paid for by each member in proportion to the acreage that he grew. The total number of acres in the association was 90.1. - A. G. Berger, County Agent, Lebanon, Lebanon County.

Considerable time this year was devoted to organizing cooperative potato-spraying associations and giving assistance to individual spraying. The number of farmers spraying potatoes was greatly increased. The following statistics show the growth of this project:

Year	: Number of spraying associations.	: Acres	: Number of farmers.
1920	: 2	: 182	: 20
1921	: 6	: 658	: 94
1922	: 16	: 1497	: 258

All but one of the 16 potato-spraying associations were handled by local men. Thus, considerable time was taken by the county agent to instruct the men in the methods of potato spraying. It was apparent from the early death of the check rows, that many farmers did not keep accurate records, but the county agent was able to get several representative records of the digging of the check rows from each association, so that our records are not nil. The average increase was 54 bushels per acre. It is estimated that at least 3,000 acres of potatoes are being sprayed in this county, either through the cooperative spraying associations or by individuals. - J. D. Hutchison, County Agent, Wilkes-Barre, Luzerne County.

Last winter, the potato-spraying work was presented at each community meeting in the county, with the result that 50 spray rings were organized, and 3 individuals started spraying. These spray rings included 406 farms, representing 2,365 acres. Each ring had officers to handle the finances and to distribute the spray materials. Each member paid a per-acre share for materials and labor and an equal share for the sprayer. Each member signed an agreement so that he had a thorough understanding of the organization. This signed agreement is a very important factor in the successful operation of the spray ring. The officers of the ring hire a man to operate the sprayer, and they see that he makes timely applications. The sprayers and materials are bought in carload lots by the county-wide potato association and distributed by truck to the farm of the secretary-treasurer of the local spray ring. The secretary-treasurer distributes materials, collects the money for the materials and sprayers, and forwards the money to the headquarters of the county growers' association. The farmers, through this system, are able to get spray materials at a price much lower than the usual wholesale price, and the association is relieved of the responsibility of collections.

Spraying is started when the plants are 6 inches high. Applications are made every 2 weeks during the season and the interval shortened to 10 days toward the end of the season. The county agent furnishes information on the operation of machines, the mixing of materials, and timely applications. Great care is exercised at all times to insure a pressure of over 200 pounds. In order to determine the actual benefit derived from the spraying of fields, four rows were left unsprayed in several fields in each community. The two center rows of this demonstration plot were dug and the yield measured and weighed; and one sprayed row on each side was dug and the yield determined. The following average results were obtained in the demonstrations checked last fall: The average yield per acre for the sprayed potatoes was 260 bushels and for the unsprayed, 174 bushels. This shows an average increase of 86 bushels per acre on the 2,365 acres. The total increase in the county yield expressed in bushels amounts to over 203,000 bushels, or 338 carloads. Six years ago the entire shipment of potatoes from Potter County was less than 300 carloads annually. A favorable influence of the spray ring system is the crystallizing of community interest. This is a conspicuous development, especially in the communities that have been organized for three or four years. The cultural methods used by the members show a marked improvement. In every community where spray rings have operated, the farmers are doing more things for themselves and working more as a unit. - Bert Shaw, County Agent, Coudersport, Potter County.

West Virginia

Insects, both eating and sucking, tip-burn and late blight, have been doing much damage to the potato crop of West Virginia. Our efforts to combat them have been so crude and of so little avail, having been carried out in such a meager way, that we realized that more concerted and combined action must be taken to solve such problems. Communities were organized by personal visits to each individual with the assistance of the county agent. A ring or club was formed with a leader who was operator and director in that community. Each member shared equally in

purchasing what was considered one of the best machines to do the required work of thoroughly coating every part of the potato plant with homemade Bordeaux (5-5-50), and where advisable, of applying the poison for leaf-eating insects. The machine purchased would spray four rows. By using three nozzles to each row, it would deliver a pressure of 150 to 200 pounds and would use 100 gallons per acre with two of the nozzles throwing the spray upward and one nozzle throwing down on each row. The leader or operator had full charge of the making and proper application of materials. Each member of the ring purchased his own material and paid the operator for time on his plot. When each member was through with his plot, he moved the machine to the plot next in the circle. The operator had a set time to make his rounds and sprayed each plot at the time designated by the plant pathology department of the West Virginia University. All sprayed potatoes show a gain in size and quantity over the unsprayed. - Dee Crane, Extension Horticulturist, College of Agriculture, West Virginia University, Morgantown.

Outstanding Points to be Considered in Organizing Potato Spray Rings.

Judging from these reports, there are certain general conditions which it would seem essential to fulfill in order to insure the successful operation of potato spray rings.

Membership and the memorandum of understanding. - Before a group of growers actually organized for spray work, it is important that the extension service assist them in analyzing their control problems and instruct them in the fundamentals of effective spray work. Will the practice be profitable? If farmers are to plan intelligently for a control organization, they must thoroughly understand their insect pest and fungus disease problems. For an understanding of the relationship of sprays to control of insects and fungi makes possible proper limitation of membership to a total acreage so localized that effective spraying with one machine is a possibility. It will be noticed in the preceding reports that the number of members to a ring varied. Rings with memberships of 6, 8, 11, 16, and 17 farmers, and rings with average total acreage of approximately 48, 50, 90, and 93 acres, reported successful work. The proximity of the fields, condition of roads, and type of machine purchased are all factors which may properly have an influence on membership. Of course the membership of a spray ring should be restricted to growers who are willing to cooperate in order to get the spray work done. An expression of intention to share in the work is not enough. An agreement of understanding, signed by each man, is important. In this agreement, it is customary to touch on such matters as method of financing the work, method of operating and sharing use of sprayer, supply of horsepower, and plans for result demonstrations. The organization once formed, a secretary-treasurer may be elected, and he, as a rule, handles the purchase of equipment and cooperative buying of supplies.

Operation of the sprayer. - The employment of an operator to do all spray work for the organization seems to be better than the arrangement by which the individual farmer does the actual work of spraying, calling for the equipment at a central point, and returning it when the work is completed. This operator may be paid a straight salary or a base wage and bonus. Such a plan makes one man responsible for the machine and for effective application. He is presumably a spray expert, and as spraying is his sole business for the period involved, he is better able to do a good piece of work than the individual farmer.

Result demonstrations important. - Experience has shown that result demonstrations, supervised by the extension pathologist, are necessary if the right methods are to become general. As a part of the agreement between the growers, provision should be made for the holding out of check rows sufficient in number and so located that at harvest time they may be used to judge the degree of success or failure of the season's work. It will be noted, that basing estimates on the comparisons between the check and sprayed areas, spray rings in 1922 reported increases in yield of potatoes resulting from spraying, as follows: 13.9 to 37.3 bushels, 30 bushels, 54 bushels, 86 bushels, 100 bushels, and 172 bushels. These figures, when compared with cost, tell the members of a ring whether or not the spray service pays. If it does not pay, over a period of years, members cannot be expected to continue the cooperative work. If it does pay, then farmers in other localities can be given this information, and the practice will continue to spread. Undoubtedly, the success of the well-known work in Pennsylvania owes much to the emphasis given this matter of demonstrations and supervision by the extension pathologist.

Conclusion. - To sum up the matter, the reports for 1922 show that progress is being made in the introduction of cooperative potato spraying. They show that in spite of local variations in type of organization, potato spray rings have been instrumental in proving, first, that potato spraying pays; and second, that in localities where well-developed programs of supervised demonstrations have been maintained, farmers have recognized the value of cooperative work, with the result that losses from diseases and insects have been in a large measure reduced.